

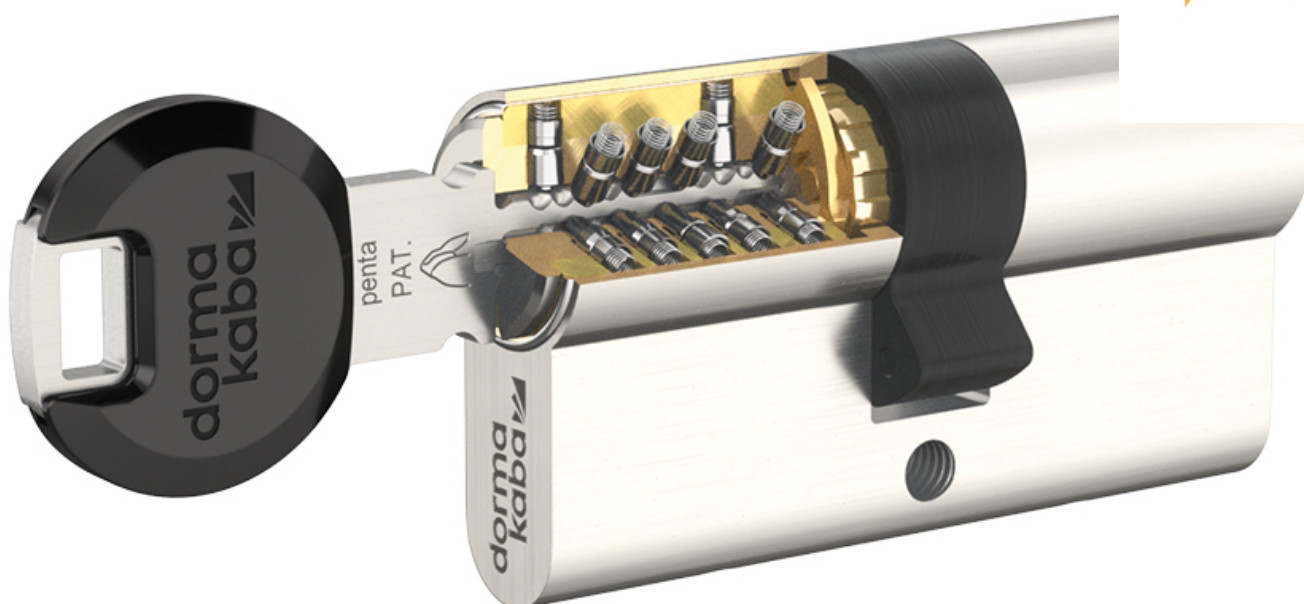
ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2




Owner of the Declaration	dormakaba International Holding GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-DOR-20210182-CBA1-EN
Issue date	01/10/2021
Valid to	30/09/2026

**Reversible Double Cylinder
penta, quattro, gemini, expert and matrix
dormakaba**

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General Information

dormakaba	Reversible Double Cylinder - penta, quattro, gemini, expert and matrix						
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	Owner of the declaration dormakaba International GmbH DORMA Platz 1 58256 Ennepetal Germany						
Declaration number EPD-DOR-20210182-CBA1-EN	Declared product / declared unit 1 piece of the product: one (1) dormakaba expert mechanical key system, consisting of the following items: - one (1) expert plus (K83) double cylinder - three (3) expert plus (K83) reversible keys - one (1) cylinder mounting screw - one (1) security card - one (1) user manual - packaging material						
This declaration is based on the product category rules: Building Hardware products, 11.2017 (PCR checked and approved by the SVR)	Scope: This EPD is a specific product declaration for the expert plus (K83) double cylinder including three keys. It is also representative for the systems penta, quattro, gemini and matrix. The underlying life cycle assessment is based on the entire life cycle of this specific mechanical key system. The products are manufactured at the dormakaba production facilities in Eggenburg (Austria). Green Electricity is being used at the production site.						
Issue date 01/10/2021	Data represents the year 2021.						
Valid to 30/09/2026	The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences. The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as EN 15804.						
 Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)  Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)	Verification <table border="1"> <tr> <td colspan="2">The standard EN 15804 serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration and data according to ISO 14025:2010</td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table>  Dr.-Ing. Wolfram Trinius (Independent verifier)	The standard EN 15804 serves as the core PCR		Independent verification of the declaration and data according to ISO 14025:2010		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Independent verification of the declaration and data according to ISO 14025:2010							
<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally						

Product

Product description/Product definition Information about the enterprise

dormakaba stands for a broad offering of products, solutions and services for smart and secure access to buildings and rooms from a single source.

Product description/ Product definition

penta cross (K90), penta (K84), quattro plus (K85), gemini plus (K87), expert cross (K89), expert plus

(K83) and matrix plus (K86) are patented, reversible master key systems representing the premium segment. The patent offers legal protection against commercial imitation. Duplicate keys are only made by dormakaba itself or by authorized partners and require identification by means of a security card.

While penta, quattro and gemini are in-house systems that are exclusively manufactured in our factories,

expert and matrix are partner systems that can also be assembled by authorized dealers.

For placing the mechanical key systems on the market in the European Union/European Free Trade Association (EU/EFTA, with the exception of Switzerland) the following legal provisions apply:

All systems are classified according to the European locking cylinder standards *EN1303* and *DIN18252*. While the basic cylinder configuration already fulfils the attack resistance class B, the highest protection grade D can be achieved with integrated carbide steel inserts.

Gebruchs- klasse category of use	Druckhaltig- keit durability	Türmasse door mass	Feuerwider- stand fire resistance	Stahlsicher- heit steel safety	Korrosionsbest- and- Temperatur corrosion resistance and temperature	Verschluss- sicherheit key related security	Angriffs- widerstand attack resistance
1	6	0	B	0	C	6	0/B/C/D

dormakaba mechanical cylinder comply with the EU regulatory *RoHS 2011/65/EU*. In addition, cylinders are fire protection tested according to *EN 1634-1* and *EN 1634-2*.

One speciality about the penta, quattro gemini, expert and matrix design is the insert modularity. This guarantees a maximum on flexibility as the interchangeable inserts can be used in different housing length as well as in all cylinder types (e.g. double-, single-, thumbturn cylinders, rim, padlocks, camlocks etc.)

For placing the mechanical key systems on the market in the European Union/European Free Trade Association (EU/EFTA, with the exception of Switzerland) the following legal provisions apply:

- *DIN EN 1303: 2015-08*
- *DIN 18252: 2018-05*
- *RoHS 2011/65/EU*

Application

The dormakaba reversible cylinder range with penta, quattro, gemini, expert and matrix can be used in both residential as well as in the commercial segment in small and simple as well as in large and complex applications, thanks to its versatility. Nearly limitless application options are possible.

Technical Data

- penta has 5 pin rows with up to 22 simultaneously used pin positions out of 85 positions in total
- quattro and expert have 4 pin rows with up to 22 simultaneously used pin positions out of 44 positions in total

- gemini and matrix have 3 pin rows with 16 simultaneously used pin positions out of 32 positions in total
- cylinder bodies are made of brass
- keys are made of nickel silver

Delivery status:

One (1) serial standard double cylinder includes three (3) keys, a mounting-screw, a user-manual and a security card. Including the packaging the cylinder will be supplied with a weight of 0,270kg.

Base materials/Ancillary materials

The material composition of the product is the following:

Name	Value	Unit
Brass	64	%
Steel	21	%
Nickel Silver	14	%
Plastic	1	%

These figures are also representative for the systems penta, quattro, gemini and matrix.

The cylinders and keys contain partial articles which contain substances listed in the Candidate List of *REACH Regulation 1907/2006/EC* (date: 19.01.2021) exceeding 0.1 percentage by mass: yes

- Lead (Pb): 7439-92-1 (CAS-No.) is included in some of the alloys used. The concentration of lead in each individual alloy does not exceed 4.0% (by mass).

The candidate list can be found on the *ECHA* website address: <https://echa.europa.eu/de/home>

Reference service life

The life cycle (security and function) of a lock cylinder is about 10-15 years, depending on the application and frequency of use. The cylinders are tested to 100,000 locking cycles minimum (*EN1303:2015-08*). This corresponds to approximately 15-18 locking cycles per day for 15 years.

LCA: Calculation rules

Declared Unit

The declared unit is 1 piece of the product: expert

Declared unit

Name	Value	Unit
Declared unit	1	piece/prod uct
Conversion factor to 1 kg	3.7	-
Mass of declared product including packaging	0.27	kg

System boundary

The type of EPD is according to EN 15804: "cradle to gate with options, modules C1–C4, and module D". The following modules are declared: A1-A3, C1-C4, D and additional modules: A4 + A5

Production - Module A1-A3

The product stage includes:

- A1, raw material extraction, processing and mechanical treatments, processing of secondary material input (e.g. recycling processes),
- A2, transport to the manufacturer,
- A3, manufacturing and assembly including provision of all materials, products and energy, as well as waste processing up to the end-of waste state.

Construction stage - Modules A4-A5

The construction process stage includes:

- A4, transport to the building site;
 - A5, installation into the building;
- including provision of all materials, products and energy, as well as waste processing up to the end-of waste state or disposal of final residues during the construction process stage.

End-of-life stage– Modules C1-C4 and D

The end-of-life stage includes:

- C1, de-construction, demolition;
 - C2, transport to waste processing;
 - C3, waste processing for reuse, recovery and/or recycling;
 - C4, disposal;
- including provision and all transport, provision of all materials, products and related energy and water use. Module D (Benefits and loads beyond the system boundary) includes:
- D, recycling potentials, expressed as net impacts and benefits.

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

Background database: *GaBi, SP40*.

LCA: Scenarios and additional technical information

Characteristic product properties

Information on biogenic Carbon

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic Carbon Content in accompanying packaging	0.01	kg C

The following technical scenario information is required for the declared modules.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel (per piece)	0.0015	l/100km
Transport distance (plane)	80	km
Transport distance (truck)	909	km
Capacity utilisation (including empty runs) average	51	%

Numbers reflect the average transport distances per cylinder.

Installation into the building (A5)

Name	Value	Unit
Waste packaging (paper)	0,03328	kg

End of life (C1-C4)

C1: The product dismantling from the building is done manually without environmental burden.

Name	Value	Unit
Collected separately	0.237	kg
Recycling	0.231	kg
Energy recovery	0.0062	kg

The product is disassembled in a recycling process. Material recycling is then assumed for the metals. The plastic components are assumed to be incinerated with energy recovery.

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Collection rate is 100%.

LCA: Results

Disclaimer:

EP-freshwater: This indicator has been calculated as "kg P eq" as required in the characterization model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; <http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml>).

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 piece, Double cylinder - penta, quattro, gemini, expert, matrix

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ -Eq.]	3.89E-1	9.50E-2	4.70E-2	0.00E+0	1.00E-3	1.60E-2	0.00E+0	-1.01E-1
GWP-fossil	[kg CO ₂ -Eq.]	4.22E-1	9.40E-2	1.00E-3	0.00E+0	1.00E-3	1.60E-2	0.00E+0	-1.01E-1
GWP-biogenic	[kg CO ₂ -Eq.]	-3.48E-2	9.16E-4	4.60E-2	0.00E+0	4.79E-5	3.65E-7	0.00E+0	2.86E-4
GWP-luluc	[kg CO ₂ -Eq.]	6.23E-4	2.02E-6	7.76E-7	0.00E+0	2.47E-8	8.85E-7	0.00E+0	-1.48E-4
ODP	[kg CFC11-Eq.]	3.71E-13	7.39E-18	8.50E-18	0.00E+0	1.09E-19	7.90E-18	0.00E+0	-3.13E-16
AP	[mol H ⁺ -Eq.]	3.12E-3	3.29E-4	1.32E-5	0.00E+0	1.04E-6	2.79E-6	0.00E+0	-6.09E-4
EP-freshwater	[kg P-Eq.]	1.57E-6	1.62E-8	1.66E-9	0.00E+0	2.22E-10	1.26E-9	0.00E+0	-5.01E-8
EP-marine	[kg N-Eq.]	3.05E-4	1.44E-4	4.77E-6	0.00E+0	3.30E-7	6.29E-7	0.00E+0	-6.20E-5
EP-terrestrial	[mol N-Eq.]	3.42E-3	2.00E-3	5.95E-5	0.00E+0	3.67E-6	1.27E-5	0.00E+0	-6.66E-4
POCP	[kg NMVOC-Eq.]	9.84E-4	4.14E-4	1.27E-5	0.00E+0	9.33E-7	1.74E-6	0.00E+0	-2.03E-4
ADPE	[kg Sb-Eq.]	1.02E-4	2.69E-9	1.34E-10	0.00E+0	3.11E-11	1.08E-10	0.00E+0	-3.50E-6
ADPF	[MJ]	5.56E+0	1.29E+0	1.50E-2	0.00E+0	1.50E-2	7.00E-3	0.00E+0	-1.17E+0
WDP	[m ³ world-Eq deprived]	1.41E-1	1.50E-4	6.00E-3	0.00E+0	2.03E-6	2.00E-3	0.00E+0	-3.30E-2

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 piece, Double cylinder - penta, quattro, gemini, expert, matrix

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	4.36E+0	3.00E-3	4.02E-1	0.00E+0	4.63E-5	2.00E-3	0.00E+0	-1.73E-1
PERM	[MJ]	3.99E-1	0.00E+0	-3.99E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	4.76E+0	3.00E-3	3.00E-3	0.00E+0	4.63E-5	2.00E-3	0.00E+0	-1.73E-1
PENRE	[MJ]	5.47E+0	1.29E+0	1.50E-2	0.00E+0	1.50E-2	1.05E-1	0.00E+0	-1.18E+0
PENRM	[MJ]	9.80E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-9.80E-2	0.00E+0	0.00E+0
PENRT	[MJ]	5.56E+0	1.29E+0	1.50E-2	0.00E+0	1.50E-2	7.00E-3	0.00E+0	-1.18E+0
SM	[kg]	2.28E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m ³]	3.80E-3	6.25E-6	1.38E-4	0.00E+0	8.31E-8	3.83E-5	0.00E+0	-1.00E-3

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 piece, Double cylinder - penta, quattro, gemini, expert, matrix

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	2.63E-8	1.23E-10	2.20E-11	0.00E+0	1.43E-12	2.77E-11	0.00E+0	-4.84E-9
NHWD	[kg]	7.00E-2	1.30E-4	1.00E-3	0.00E+0	1.50E-6	2.00E-3	0.00E+0	-1.50E-2
RWD	[kg]	2.70E-4	1.12E-6	7.83E-7	0.00E+0	1.58E-8	2.69E-7	0.00E+0	-2.05E-5
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.17E-1	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	2.60E-2	0.00E+0	7.10E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	4.70E-2	0.00E+0	1.29E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components

	for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy								
RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 piece, Double cylinder - penta, quattro, gemini, expert, matrix									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	1.40E-2	0.00E+0	0.00E+0	ND	ND	0.00E+0	0.00E+0	0.00E+0
IRP	[kBq U235-Eq.]	0.00E+0	0.00E+0	0.00E+0	ND	ND	0.00E+0	0.00E+0	0.00E+0
ETP-fw	[CTUe]	0.00E+0	0.00E+0	0.00E+0	ND	ND	0.00E+0	0.00E+0	0.00E+0
HTP-c	[CTUh]	0.00E+0	0.00E+0	0.00E+0	ND	ND	0.00E+0	0.00E+0	0.00E+0
HTP-nc	[CTUh]	0.00E+0	0.00E+0	0.00E+0	ND	ND	0.00E+0	0.00E+0	0.00E+0
SQP	[-]	0.00E+0	0.00E+0	0.00E+0	ND	ND	0.00E+0	0.00E+0	0.00E+0
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index								

Disclaimer 1 – for the indicator “potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators: “abiotic depletion potential for fossil resources”, “abiotic depletion potential for non-fossil resources”, “water (user) deprivation potential”, “deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans - cancer effects”, “potential comparative toxic unit for humans – non-cancer effects”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

References

DIN 18252

DIN 18252: 2018, Profile cylinders for door locks – Terminology, dimensions, requirements, test methods and marking

DIN EN 1303

DIN EN 1303: 2015, Building Hardware - Cylinders for locks - Requirements and test methods

DIN EN 1634-1

DIN EN 1634-1:2018, Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware

DIN EN 1634-2

DIN EN 1634-2:2009, Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware

DIN EN ISO 14025

DIN EN ISO 14025:2011, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

EN 15804

EN 15804:2019+A2, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

REACH Regulation

REACH Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals.

RoHS 2011/65/EU

RoHS 2011/65/EU, Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

European Chemicals Agency (ECHA)

<https://echa.europa.eu/de/>

Further References

IBU

Institut Bauen und Umwelt e.V.: General Instructions for the EPD Programme of Institut Bauen und Umwelt e.V. Version 2.0., Berlin: Institut Bauen und Umwelt e.V., 2021. www.ibu-epd.com

GaBi ts software

Sphera Solutions GmbH
Gabi Software System and Database for Life Cycle Engineering 1992-2020
Version 10.0.0.71
University of Stuttgart, Leinfelden-Echterdingen

GaBi ts documentation

GaBi life cycle inventory data documentation (<https://www.gabi-software.com/support/gabi/gabidatabase-2020-lci-documentation/>).

LCA-tool dormakaba

LCA tool, version 1.0.
Developed by Sphera Solutions GmbH

PCR Part A

PCR – Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Re-port according to EN 15804+A2:2019, Version 1.0, Institut Bauen und Umwelt e.V., www.ibu-epd.com.

and physical Access Control Systems , version 1.2, Institut Bauen und Umwelt e.V., www.ibu-epd.com, 2017.

PCR Part B

PCR – Part B: Requirements on the EPD for Electronic

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